Table 1
Remedial Objectives and Proposed Milestones
MVT TSO Summary Report
Mission Valley Terminal, San Diego, CA
LFR 002-10180-13

Remedial Goal as Stated in the TSO	Interim Remedial Objectives	Remedial Strategy and Approach	Comment/Rationale	Proposed Treatment Technology and Implementation Plan	Implementation Milestones			Cleanup Milestones			Contingencies		
					Milestone	Date	Basis	Milestone	Date	Basis	Trigger	Action	Rationale
	Reduce the flux of contaminant mass in the downgradient portion of the plume (i.e. at Transect 2) such that the concentrations of the site COCs at the wellhead of a hypothetical supply well are below Federal and State Drinking water standards.	Reduce the groundwater mass flux of COCs, from the off-site residual LNAPL area to the Mission San Diego Hydrologic sub area proposed for development for municipal use, to below mass flux targets. COC mass flux reduction will allow dissipation of the downgradient plume while protecting potential receptors and restoring the aquifer to beneficial use within a reasonable time frame.	Operation of a source containment barrier downgradient of the off-site residual LNAPL area acts to protect beneficial use of groundwater downgradient from that barrier.	Continue operation of the existing source containment barrier downgradient of the off-site residual LNAPL area. Operate until terminal property COC mass flux, and COC concentrations in the off-site residual LNAPL area are reduced to levels that achieve the mass flux targets with no active off-site remedial activities taking place, or asymptotic levels. At this time alternate remedial strategies (e.g., monitored natural attenuation) will be evaluated.	Hydraulic source containment barrier downgradient of the residual LNAPL area.	Installed and operating		MTBE mass flux across Transect 2 reduced to less than 5 g/day	Current	The off-site source containment barrier downgradient of the residual LNAPL is successfully reducing COC mass flux downgradient of the residual LNAPL area to below the mass flux targets.	A trend toward groundwater COC mass flux downgradient of the off-site residual LNAPL area greater than the COC mass flux targets.	Enhance the source containment barrier downgradient of the off-site residual LNAPL.	Based on current Site Conceptual Model, the hydraulic mass flux barrier downgradient of the off-site residual LNAPL area appears to be effective in reducing the COC mass flux at transects 1& 2 to below the mass flux targets. Enhancements to the existing system, if warranted, likely would be similarly effective. As a possible contingency, wellhead treatment for COCs reduction at a water supply well could be a possible alternative action compatible with development of basin groundwater for potable use.
					Expansion of SVE system to effectively treat the entire off-site residual LNAPL source area.	08/01/04	Thirteen (13) additional SVE wells have been installed; associated infrastructure construction activities underway.	Reduce the COC concentrations in soil gas to below the risk-based target concentrations for commercial workers in the off-site area (i.e., parking lot, and stadium areas).	Current	Based on current land use, there are no indoor workers in the parking lot area. As described in the Health Risk Assessment, Off-Site Areas Report, current outdoor workers and stadium visitors are not being exposed to significant risk due to present COC concentrations in the soil gas.			
								Reduce measureable thicknesses of LNAPL in the off-site area to less than 0.01 feet.	01/2007	Historical trend of LNAPL thickness in off-site area monitoring wells indicates that a reduction of measureable LNAPL thicknesses to 0.01 feet will be achieved in this time frame.	A trend toward increasing LNAPL thickness measurements feet in more than two monitoring wells for three consecutive quarterly monitoring events.	Enhance LNAPL recovery measures in the off-site area.	Current site conceptual model indicates that the off-site LNAPL is in immobile residual phase. As such, any future increases in measureable thicknesses of LNAPL that may be observed will likely be due to localized conditions and vertical movement of the groundwater table. LNAPL recovery alternatives will be evaluated, as warranted and an appropriate solution (e.g., bailing, dual-phase extraction, passive-collection methods) will be implemented.
"Restore water quality in the portion of the Mission San Diego Hydrologic sub area proposed for development by the City of San Diego for municipal use"	Reduce the flux of contaminant mass from the downgradient boundary of the off-site LNAPL source area such that the concentrations of the site COCs at the wellhead of a hypothetical well are below Federal and State drinking water standards.	1. Reduce/eliminate COC mass flux from the terminal property to the off-site area. 2. Attenuate residual LNAPL in the off-site source area. 3. Reduce COC concentrations within the off-site source area to levels that enable the mass flux of COCs in groundwater from this area to be less than the risk-based mass flux targets with no further containment of this area.	It is not currently certain what portion of the COC mass recovered by the downgradient source containment barrier originates from the on-site vs the off-site residual LNAPL areas. However, property boundary mass flux estimates indicate that reduction/elimination of COC mass flux from the terminal property would likely aid substantially in the reduction of COC mass flux downgradient of the off-site source area in a relatively short time frame. Reduction/elimination of the COC mass flux from the terminal property, combined with SVE in the off-site source area should be successful in achieving the remedial objectives. At a minimum, this strategy will enable expedient progression toward accomplishing the remedial objectives for the off-site area. Monitoring and evaluation of treatment system operation and performance will result in a more thorough understanding of where to focus any warranted future remedial enhancements.	Expand the SVE system to effectively treat the entire off-site residual LNAPL source area for COC mass reduction and LNAPL reduction. Operate until COC concentrations in the off-site source area are reduced to levels that achieve the mass flux targets with no further active off-site remedial activities. Install a containment barrier at the property boundary of the terminal to intercept dissolved-phase COCs from migrating off-site. The barrier technology will be selected based on the results of site-specific evaluation. During the initial three years of operation of the property boundary barrier, monitoring of performance and the distribution of dissolved phase COCs in the off-site source area will result in a more thorough understanding of where to focus any warranted future remedial enhancements.	Install a containment barrier at the terminal's southern property boundary.	12/31/05	The appropriate barrier technology will be selected based on site-specific feasibility evaluation. Current plans include selection of a barrier technology prior to the end of 2004 with the barrier to be installed and operational on or before December 31, 2005.	Reduce the COC mass flux across the terminal's southern property boundary and COC concentrations within the off-site source area to levels that enable the COC mass flux at Recovery Wells RW-8, and RW-9 to be less than the risk-based mass flux targets.	RW-9 01/2011 RW-8 01/2012	This cleanup milestone is based on the time required to capture two pore volumes within the current areas of high COC concentration around these extraction wells.	Milestone not met.	Continue groundwater extraction from RW-8 and/or RW-9.	
					Expanded remedial systems (i.e. add'l SVE wells and property boundary containment barrier) operational for a period of three years.	01/2009	Three years is a reasonable time frame to monitor the performance trends of the expanded treatment system and its progress toward remedial objectives.	Reduce the terminal property boundary COC mass flux and COC concentrations within the off-site source area to levels that enable the COC mass flux in groundwater from the off-site area to be less than the mass flux targets with no active further off-site remedial activities or containment.	2015 to 2034	It's estimated that MTBE will continue to persist above mass flux targets in the saturated zone of the off-site source area for 1.7 to 30 years. If LNAPL depletion in the affected soil beneath the current water table occurs primarily through dissolution into groundwater. Extrapolation of site-specific empirically-derived soil-vapor extraction rates suggest that both benzene and MTBE may persist above the mass targets in the unsaturated zone for 1 to 3 years.	Progress metrics to meet cleanup milestones are not being met.	Continue operation of SVE system, and evaluate enhancements to off-site source area remedial systems. Implement remedial system enhancements, as may be warranted, based on the results of the evaluation.	Estimates of COC mass flux from the terminal property boundary to the off-site area indicate that reduction/elimination of COC mass flux from the terminal property would likely aid substantially in the reduction of dissolved-phase COC mass flux downgradient from the off-site residual LNAPL area in relatively short time frame. Three years is a reasonable time frame to monitor the performance trends of the expanded remedial systems and progress toward achieving remedial objectives. If progress toward cleanup milestones is determined to be insufficient, an evaluation of technologies to enhance the remedial activities will be performed. Based on the results of this evaluation, appropriate technology(ies) will be selected and implemented, as warranted.
					Performance evaluation of the remedial systems will be completed and reported to the RWQCB.	06/01/09	Evaluation to review the potential need for additional measures to enhance the effectiveness of the remedial systems' progress toward achieving cleanup milestones						
"Clean up all off site pollution"	During and after the objectives described above are achieved, reduce the flux of contaminant mass from the terminal downgradient property boundary such that the flux of contaminant mass from the property boundary no longer results in impacts to the beneficial use of off site groundwater.	Reduce/eliminate COC mass flux from the terminal property to the off-site area. Actively remediate the off-site residual LNAPL area to reduce COC concentrations to levels that enable the groundwater COC mass flux from this area to be less than the mass flux targets with no active off-site remedial activities. Allow natural attenuation processes to attenuate remaining COC concentrations in off-site LNAPL-affected area to levels that comply with Basin Plan water quality objectives.	It is not necessary to remove all residual LNAPL from the off-site area using active remedial measures. However, active remedial activities may be terminated when beneficial use of the Mission San Diego hydrologic sub area groundwater is achieved (SWRCB Resolution 92-49). It is expected that any residual LNAPL remaining in the off-site area, after active remedial measures are terminated, will naturally attenuate over time.	Implementation of the LNAPL area remedies and contingencies described above, with continued operation of the mass flux barrier at property boundary.				Beneficial use of groundwater downgradient of the terminal's southern property boundary is restored.		Timeframes for achieving clean-up goals are highly uncertain and are potentially very long. For the off-site area near the Mission Valley Terminal, an extended timeframe may be necessary to achieve final clean-up goals and is reasonable if the remnant LNAPL area and dissolved-phase plume are stable or improving, and beneficial uses are not being impaired.			

TABLE 2
Risk-Based Target Concentrations (RBTCs) for Chemicals in Groundwater - Potential Future Commercial Workers
Off-Site Areas, Mission Valley Terminal
LFR 002-10180-13

Chemical	Potential Future Commercial RBTCs in Groundwater (mg/L)					
	Stadium Area - Subgrade		Stadium Area - Street Level		Parking Lot Area - Street Level	
	Cancer	Noncancer	Cancer Risk	Noncancer	Cancer Risk	Noncancer
Benzene	7.8	4.80.E+06	48	2.90.E+07	16	9.70.E+06
Chlorobenzene	NC	1.30.E+08	NC	8.80.E+08	NC	2.70.E+08
Ethylbenzene	NC	1.20.E+08	NC	8.20.E+08	NC	2.60.E+08
Methyl tertiary butyl ether (MTBE)	4,100	6.00.E+09	23,000	3.40.E+10	8,400	1.20.E+10
Tertiary butyl alcohol (TBA)	NC	NA	NC	NA	NC	NA
Toluene	NC	2.00.E+07	NC	1.30.E+08	NC	4.20.E+07
1,2,4-Trimethylbenzene	NC	520	NC	3,500	NC	1,100
1,3,5-Trimethylbenzene	NC	370	NC	2,500	NC	770
Xylene	NC	4.60.E+07	NC	3.10.E+08	NC	9.70.E+07

Notes:
NA = Not applicable
NC = Not calculated because chemical is not evaluated as a carcinogen

mg/L = microgram/liter

TABLE 2

Risk-Based Target Concentrations for Chemicals in Soil Gas - Potential Future Commercial Workers - Parking Lot Area (Street Level)

Off-Site Areas, Mission Valley Terminal

LFR 002-10180-13

Chemical	Potential Future Commercial RBTCs in Soil Gas (ppbv) - Parking Lot Area (Street Level)			
	Near Surface Soil Gas		Near Watertable Soil Gas	
	Cancer	Noncancer	Cancer	Noncancer
Benzene	470	2.90.E+08	2,800	1.72.E+09
Chlorobenzene	NC	3.36.E+09	NC	2.33.E+10
Ethylbenzene	NC	7.13.E+09	NC	4.84.E+10
Methyl tertiary butyl ether (MTBE)	23,000	3.43.E+10	1.31.E+05	1.93.E+11
Tertiary butyl alcohol (TBA)	NC	NC	NC	NC
Toluene	NC	1.23.E+09	NC	7.37.E+09
1,2,4-Trimethylbenzene	NC	19,000	NC	1.27.E+05
1,3,5-Trimethylbenzene	NC	19,000	NC	1.27.E+05
Xylene	NC	2.49.E+09	NC	1.66.E+10

Notes:

NA = Noncancer toxicity value not available.

NC = Not calculated because chemical is not evaluated as a carcinogen

ppbv = parts per billion by volume

TABLE 2
Risk-Based Target Concentrations (RBTCs) for Chemicals in Soil Gas - Potential Future Commercial Workers - Stadium Area (Street Level)
Off-Site Areas, Mission Valley Terminal
LFR 002-10180-13

Chemical	Potential Future Commercial RBTCs in Soil Gas (ppbv) - Stadium Area (Street Level)			
			Near Watertable Soil Gas	
	Cancer	Noncancer	Cancer	Noncancer
Benzene	530	3.22.E+08	940	5.75.E+08
Chlorobenzene	NC	3.72.E+09	NC	7.25.E+09
Ethylbenzene	NC	7.91.E+09	NC	1.52.E+10
Methyl tertiary butyl ether (MTBE)	26,000	3.80.E+10	48,000	7.00.E+10
Tertiary butyl alcohol (TBA)	NC	NA	NC	NA
Toluene	NC	1.36.E+09	NC	2.45.E+09
1,2,4-Trimethylbenzene	NC	21,000	NC	40,000
1,3,5-Trimethylbenzene	NC	21,000	NC	40,000
Xylene	NC	2.76.E+09	NC	5.25.E+09

Notes:
NA = Noncancer toxicity value not available.
NC = Not calculated because chemical is not evaluated as a carcinogen

ppbv = parts per billion by volume

TABLE 2
Comparison of Risk-Based Target Concentrations (RBTCs) for Soil Gas to Site Data[a]
Off-Site Areas, Mission Valley Terminal
LFR 002-10180-13

Chemical	SV-1 (Parking Lot Area - Street Level)						SV-2 (Stadium Area - Street Level)					
	Near Surface Soil Gas[b]			Near Watertable Soil Gas[c]			Near Surface Soil Gas[d]			Near Watertable Soil Gas[e]		
	Sample Results	Future Commercial RBTC	Future Residential RBTC	Sample Results	Future Commercial RBTC	Future Residential RBTC	Sample Results[g]	Future Commercial RBTC	Future Residential RBTC	Sample Results	Future Commercial RBTC	Future Residential RBTC
Benzene	4,300	530	6.4	5,700	940	53	310	470	5.8	8.1	2,800	260
Chlorobenzene	<1.0	3.7E+09	2.9.E+07	<1.0	7.2.E+09	2.9.E+08	<1.0	3.4.E+09	2.7.E+07	<1.0	2.3.E+10	1.4.E+09
Ethylbenzene	3,100	7.9E+09	6.3.E+07	4,200	1.5.E+10	6.0.E+08	350	7.1.E+09	5.6.E+07	620	4.8.E+10	3.0.E+09
Methyl tertiary butyl ether (MTBE)	<1.0	26,000	310	<1.0	48,000	2,800	100	23,000	280	370	130,000	12,000
Tertiary butyl alcohol (TBA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	4,600	1.4.E+09	1.1.E+07	5,700	2.4.E+09	9.0.E+07	500	1.2.E+09	9.7.E+06	35	7.4.E+09	4.5.E+08
1,2,4-Trimethylbenzene	3,000	21,000	160	2,200	40,000	1,600	1,000	19,000	150	33	130,000	7,500
1,3,5-Trimethylbenzene	2,000	21,000	160	2,200	40,000	1,600	500	19,000	150	23	130,000	7,500
Xylenes[f]	8,200	2.8.E+09	2.2.E+09	8,200	5.2.E+09	2.0.E+08	1,780	2.5.E+09	2.0.E+07	1,260	1.7.E+10	1.0.E+09

Notes:
ppbv = parts per billion by volume

[a] Risk based target concentrations (RBTCs) presented are minimum of cancer and noncancer RBTCs for these scenarios. Site data presented are from samples collected on September 9, 2002.
[b] Near surface soil gas sample from SV-1 taken at 3 feet below ground surface (bgs).
[c] Near source soil gas sample from SV-1 taken at 12 feet bgs.
[d] Near surface soil gas sample from SV-2 taken at 4 feet bgs.
[e] Near source soil gas sample from SV-2 taken at 29.5 feet bgs.
[f] Site data for xylenes are presented as the sums of m,p-xylene and o-xylene measurements.
[g] Sample from SV2-AS taken on September 9, 2002 did not meet the data quality objectives of the workplan since the vapor probe was filled with water which had to be bailed out prior to sampling. The data from this sample should therefore be considered qualitative.